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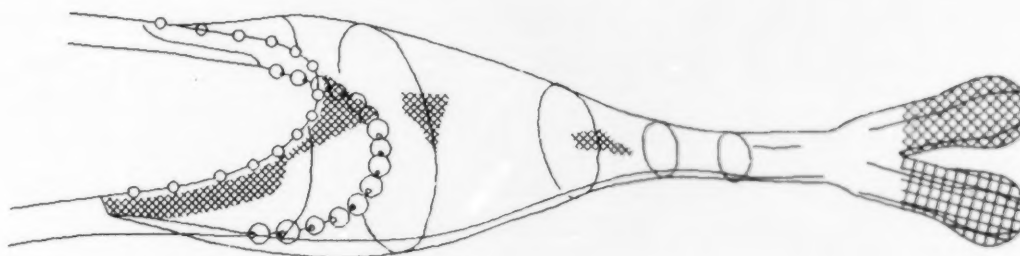
PROJECT SUMMARY

Newfoundland Region

No. 30

July, 1991

THE EFFECT OF COD END MESH SIZE AND SHAPE ON OTTER TRAWL PERFORMANCE



PURPOSE

To compare the size of fish caught during a cod directed, commercial bottom trawl fishery in Division 2J using different sizes of square and diamond mesh codends.



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Background

Both the Harris Report and the report of the Dunne Task Force highlighted the importance of increasing mesh size in order to facilitate escapement of immature fish of the northern (2J3KL) cod stock. Release of these small fish should result in increased yield in future years, and contribute to an increase in the spawning biomass of this stock. From industry's point of view, increased release of small fish should also reduce labour required to sort catches on board vessels, improve overall fish quality and improve productivity during processing by increasing the proportion of large fish.

Several investigations have been conducted to determine the selectivities of different mesh sizes for cod as well other species. These experiments have generally been carried out under controlled conditions and are considered to be "direct" selectivity experiments in that the sizes of fish capable of escapement through the different sized and shaped meshes have been determined. These are types of studies compared to examinations of mesh performance undertaken during commercial fishing operations.

Several selectivity studies have been conducted in the Scotia Fundy Region over the past five years. In Newfoundland, some selectivity work was carried out by the Provincial Government in 1983. At that time, comparisons of commercial cod catches using 130mm diamond mesh and 140mm square mesh codends demonstrated that the difference between the two meshes was significant with the diamond mesh retaining a greater number of fish less than 50 centimetres (19.69 inches).

Materials and Methods

The experiments were conducted onboard the Fishery Products International Ltd. (F.P.I.) stern trawler Zandvoort during a commercial fishing trip to Division 2J during November 29 to December 11, 1990 (See Figure 1). The traditional groundfish trawl (Engel High Lift) was modified to accommodate a trouser-type codend.

Throughout the trip, the starboard leg of the trouser was 130mm diamond mesh (regulation size), while the port leg was changed to a different mesh type after completing a number of successful sets. A successful set was defined as one in which there was no damage to the codends, sufficient fish were captured in each side of the trouser to provide an adequate sample, and sets were not large enough to result in mixing of fish in the two legs or on the fish holding ramp.

The ramp which holds the fish onboard was divided to separate the fish from both codends. Random

samples were taken from each side of the ramp (representing the two legs) for all successful sets. These samples were taken over the entire processing period so as to be fully representative of the respective catches. Lengths were taken in three centimetre groupings, and a minimum of 200 fish were sampled from each leg for each set. The total set catch (both legs combined after discarding) was estimated from the number of boxes of processed (head-on gutted) fish in the hold.

During the trip mesh size and shape comparisons were carried out as follows:

- 130mm diamond vs. 130mm diamond (Control to test that both legs of the trouser were performing the same)
- 130mm diamond vs. 140mm square
- 130mm diamond vs. 155mm diamond
- 130mm diamond vs. 130 square

Results

For the control experiment (130mm diamond in both legs), only two successful sets were completed because of low catches coupled with time constraints. Results indicated that the length range and average size of fish were about the same, and the percent of small fish was approximately equal (See Table 1).

Six sets were completed comparing 130mm diamond mesh and 140mm square mesh. Results from the first four sets indicated that fewer small fish were taken in the leg with 140mm square mesh, but results for the last two sets suggest the opposite. Overall, in each set, less weight and numbers were caught in the 140mm square mesh leg. However, analysis did not reveal any significant difference in the selectivity of the meshes (See Table 2).

Six successful sets were also completed for the comparison of 130mm diamond mesh and 155mm diamond mesh. Again the proportion of total catch (by weight) was less in the leg with the larger mesh. For each set, the proportion of small fish in the 155mm leg was less, but the difference varied from set to set (See Table 3).

Four successful sets were completed to compare 130mm diamond mesh and 130mm square mesh. The proportion of fish in each leg of the trouser was equal, but results for the first three sets are opposite to what was expected. For these sets, the diamond mesh retained less small fish than did the square mesh. There was very little difference between the overall frequencies of the two meshes, and detailed analysis did not indicate any significant difference in the selectivities (See Table 4).

TABLE 1: Summary of results of comparisons of 130 mm diamond in port and starboard legs of trouser trawl.

Set Number	Mesh Size/Type	Number Caught	Length Range (cm)	Weighted Average Length (cm)	Percent of Fish ≤ 44 cm Retained (%)	Percent of Total Catch (Wt.)	Est. Total Catch (kg)
12	130 Dia	1177	27-71	51.00	23	50	1478.5
	130 Dia	1231	30-74	50.20	24	50	1478.5
15	130 Dia	973	33-80	51.84	21	50	1279.1
	130 Dia	957	30-77	52.01	20	50	1279.1

TABLE 2: Summary of results of comparisons of 130 mm diamond in port leg and 140 mm square in starboard leg of trouser trawl.

Set Number	Mesh Size/Type	Number Caught	Length Range (cm)	Weighted Average Length (cm)	Percent of Fish ≤ 44 cm Retained (%)	Percent of Total Catch (Wt.)	Est. Total Catch (kg)
18	140 SQ	851	30-71	54.34	8	40	957.8
	130 Dia	1123	30-71	51.52	18	60	1436.7
20	140 SQ	588	36-77	54.50	8	30	877.8
	130 Dia	1482	36-77	52.93	14	70	2048.2
21	140 SQ	736	36-77	53.42	8	40	1071.0
	130 Dia	1171	33-68	52.91	14	60	1806.5
24	140 SQ	1376	30-71	50.86	20	38	1685.2
	130 Dia	2188	30-71	49.75	27	62	2527.8
25	140 SQ	1295	33-71	51.99	14	40	1688.1
	130 Dia	1837	33-71	52.97	12	60	2532.2
26	140 SQ	1492	33-77	51.32	22	35	1893.6
	130 Dia	2759	30-71	51.47	19	65	3516.8

TABLE 3: Summary of results of comparisons of 130 mm diamond in port leg and 155 mm diamond in starboard leg of trouser trawl.

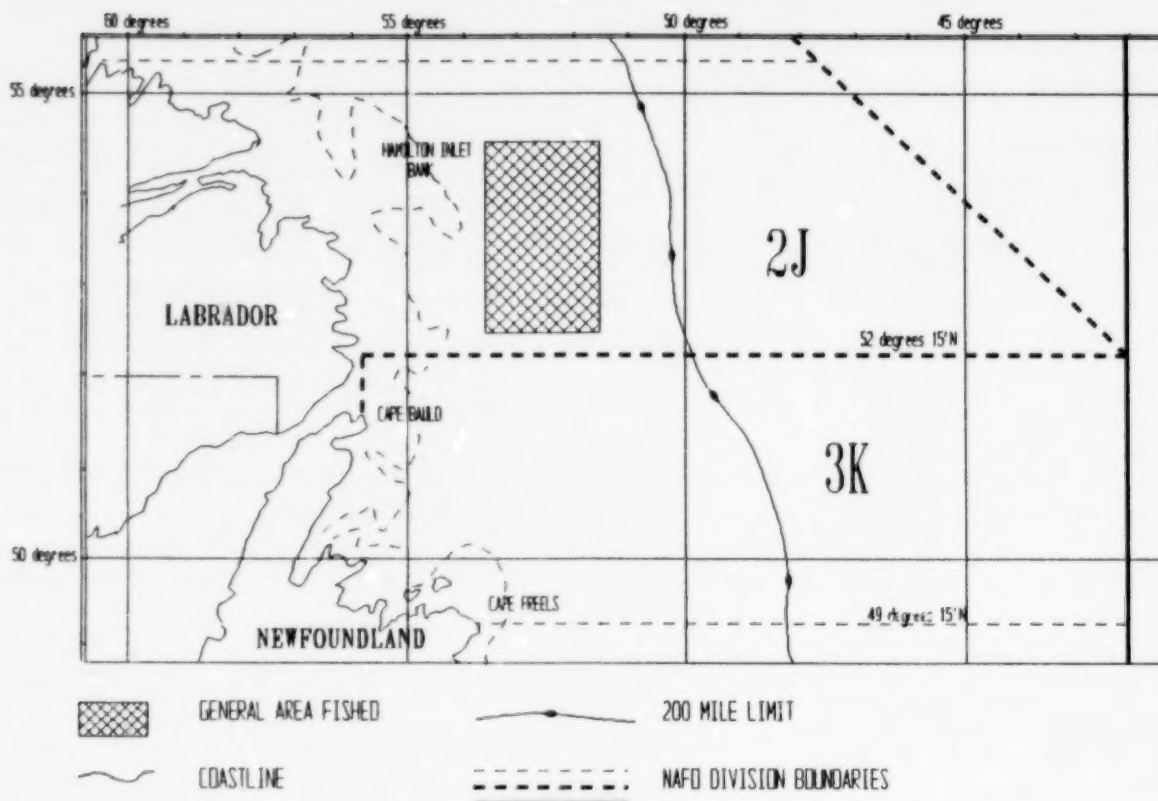
Set Number	Mesh Size/Type	Number Caught	Length Range (cm)	Weighted Average Length (cm)	Percent of Fish ≤ 44 cm Retained (%)	Percent of Total Catch (Wt.)	Est. Total Catch (kg)
27	155 Dia	1074	30-77	51.88	21	35	1418.4
	130 Dia	2263	30-68	49.96	22	65	2634.2
29	155 Dia	929	30-71	52.66	17	30	1271.9
	130 Dia	2396	30-71	51.03	21	70	2967.9
31	155 Dia	474	24-77	54.99	9	30	730.8
	130 Dia	1172	30-74	53.82	13	70	1705.2
34	155 Dia	596	36-77	55.33	7	30	928.3
	130 Dia	1664	30-74	51.81	16	70	2166.1
38	155 Dia	759	33-71	54.79	7	25	1142.0
	130 Dia	2426	33-71	53.49	11	75	2426.1
39	155 Dia	599	36-77	53.84	7	30	903.5
	130 Dia	1624	30-86	51.74	18	70	2106.2

TABLE 4: Summary of results of comparisons of 130 mm diamond in port leg and 130 mm square in starboard leg of trouser trawl.

Set Number	Mesh Size/Type	Number Caught	Length Range (cm)	Weighted Average Length (cm)	Percent of Fish ≤ 44 cm Retained (%)	Percent of Total Catch (Wt.)	Est. Total Catch (kg)
41	130 SQ	1200	30-68	49.6	25	50	1362.3
	130 Dia	1118	30-74	50.79	19	50	1362.3
42	130 SQ	1828	30-74	48.42	30	50	1950.2
	130 Dia	1819	30-71	48.56	21	50	1950.2
43	130 SQ	1146	27-77	48.86	30	50	1255.8
	130 Dia	1085	27-74	49.6	28	50	1255.8
47	130 SQ	1855	27-77	48.76	29	50	2029.2
	130 Dia	1920	27-72	48.16	34	50	2029.2

FIGURE 1

AREA OF FISHING OPERATIONS



Conclusions

The results of this experiment did not indicate significant differences in the selection of fish sizes by the different sizes and shapes of mesh examined. Only during comparisons of 155mm diamond mesh and 130mm diamond mesh were there any apparent differences, but these were not significant. It is not possible to determine the reasons for the results obtained.

Overall, catches of both large and small fish were less when using 140mm square mesh and 155mm diamond mesh compared to the 130mm diamond mesh codend.

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Recommendations

Results from only one fishing trip are insufficient to conclude which mesh size and shape is most suitable to facilitate escapement of fish under five years old.

Further studies are required to compare 130mm diamond mesh to 140mm diamond mesh, 130mm square mesh, and 140mm square mesh. Also, future otter trawl selectivity studies should use a divider panel extending from the headrope and footrope to the trouser.

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